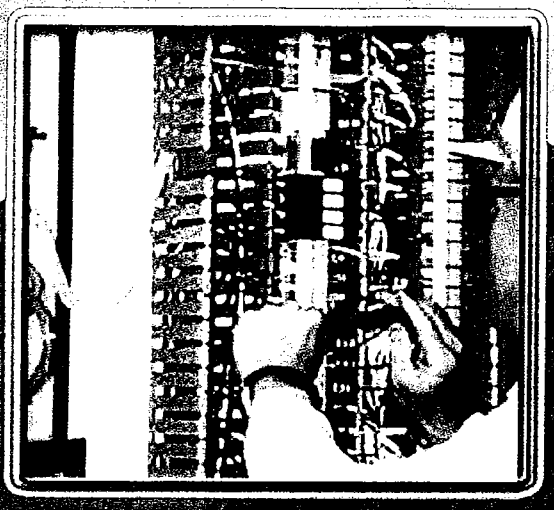
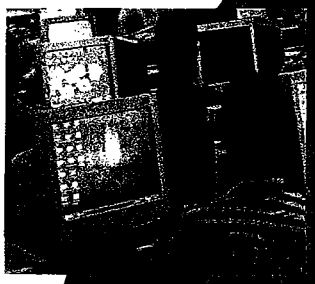
التوظيف والتدريب
EMPLOYMENT & TRAINING





Electrical

Electrical

Direct inquiries to

Iraq Ministry of Labor & Social Affairs (MOLSA)
Baghdad, Iraq

Management & Training Corporation
500 N. Marketplace DR.
Centerville, Utah 84014

Jill L. Elkins -801-693-2714 (USA)

Michael Roberts -801-693-2600 (USA)

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Acknowledgments

Standards in this document are based on information from the following organizations:

U. S. Office of Job Corps	US Department of Labor, Office of Job Corps national standards.
Contren Learning Series Best Practices	Reprinted with permission from *Contren Learning Series*, Copyright © 2002, National Center for Construction Education and Research, (352) 334-0920, http://www.nccer.org/
Workplace Skills for the 21st Century	Secretary's Commission on Achieving Necessary Skills

Curriculum development, training and translation in Iraq were provided by the following team:

Timothy Mizen-England
Deputy Chief of Party
Iraq Vocational Training Project.

Osama A. Issa - Jordan
Microsoft Certified Trainer (MCT).

Daniel Costelloe-Australia
Electrical Contracting Consultant.

Leslie Alexander Lawrence-Indonesia
Engineering Management Consultant.

Robert R. Caldwell-United States
Automotive Training Consultant.

The Managers and Vocational Trainers
for the Iraq Ministry of Labor and Social Affairs (MOLSA).

The Iraqi Staff of Iraq Vocational Training and Employment and Services Project

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Overview

Vocational training programs in Iraq are faced with many challenges. Iraq needs a speedy reconstruction and the Iraqi people need a future with the promise of employment and prosperity.

This training will combine occupational skills with technical knowledge and will be competency based. We will customize training to meet employer demands, cultural differences, geographic location, and needs of the trainees. The technical approach is modeled after the U.S. Department of Labor, Employment and Training Administration, Office of Youth Services and Job Corps training model. This curricula is competency-based, meaning that the student actually demonstrates a competency in practice and assessments. The Job Corps vocational training curricula consist of competency objectives with corresponding lessons and tasks or skill assignments. Following completion of each level of difficulty or assigned task, assessment tools determine competency and will help with evaluation and remediation. The competency-based instructional programs will:

- Assess the trainee's needs, including strengths and weaknesses
- Select appropriate instructional goals based on the needs assessment
- Provide trainee-centered instruction aimed at the instructional goals
- Evaluate to determine if the trainee has mastered the goals and can apply them

The instructional design (competency-based) will let the trainees demonstrate competency for the skills they already have and then begin instruction at the point where competency is not demonstrated. From there, the trainee will progress through the competencies listed on a Training Achievement Record until they complete training and are prepared to work.

These instructional materials include a Training Achievement Record (TAR). TARs list each competency required for the trade grouped by skill type. The curricula also include sample lesson plans. The curricula will provide for development in general areas prior to competency in more specific trade areas. This allows those who are not able to complete an entire program to develop skills suitable for lower levels of employment.

This curriculum has been developed in collaboration with MOLSA instructors, Job Corps training experts, and other technical professionals. It was created for use in all MOLSA vocational technical training centers that educate and train students to become competent, entry-level electrical. This curriculum will provide instructors with the necessary ingredients for a complete electrical technician program. The purpose of this guide is to establish a common language of proficiency standards so that both the Vocational

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Technical Training Centers and industry have a universal set of standards for electrical programs.
This curriculum has been developed for use by all Iraq Vocational Technical Training Centers that offer programs in electrical technology. Because of the great diversity among the different regions of the country, this curriculum was designed, to be a flexible document that allows for the differences in instructor methodology. There are also differences in the length of programs and differences in equipment at some of the MOLSA centers. All content areas and competencies must be integrated into the training center electrical curricula so that students become competent in those areas.

This curriculum does not offer a step-by-step formula for teaching an electrical course. This guide is designed to facilitate the classroom work of electrical instructors but not to replace the decision-maker.

This curriculum has been aligned to modules in the Contren Learning Series as endorsed by the National Center for Construction Education and Research (NCCER). Students who successfully pass this course may be certified by MOLSA and will receive documentation from MOLSA.

It is the instructor who organizes instructional materials for effective and efficient learning. And **it is the instructor** who integrates the latest teaching technologies into his or her classroom. It is in support of these professionals and of their students that this curriculum has been developed.

Each vocational course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Module Number and Title (TAR Skillset)

- Suggested Time to Train on Skillset - An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the module. The curriculum framework should account for approximately 75-80 percent of the time in the course.

- Competencies and Outcomes
  - A competency represents a general concept or performance standard that students are expected to master as a requirement for satisfactorily completing a module. The student, instructor and worksite supervisor (if applicable) will evaluate and record a pre-training mastery level for all skillsets, as well as a post-training mastery level review.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

- The outcomes represent the enabling and supporting knowledge and demonstrated performances that will indicate mastery of the competency at the course level.

- Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

- Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources, however, the only required assessment is completion of the TAR checklist.

- References - A list of suggested references is provided for each unit in the appendix. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested outcomes. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

TABLE OF CONTENTS

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Vocational Training Description

Electrical training prepares a student for entry-level employment in electrical related careers and/or for further study at the postsecondary level. Emphasis is on safety, tools and test equipment, components and functions, theory, hand and power tools, blueprints and specification, materials and installation, circuit layout and wiring, equipment connections and other electrical processes.

The content of the electrical curriculum framework follows the recommended national standards for the U.S. Office of Job Corps.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

COURSE OUTLINE

ELECTRICIAN I

Module#	Title	No. of Hours
Module 1	Employability Skills	15.0 hours
Module 2	Basic Electricity Theory	25.0 hours
Module 3	Safety	20.0 hours
Module 4	Introduction to Electricity	15.0 hours
Module 5	Hand and power Tools	10.0 hours
Module 6	Blueprints and specifications	10.0 hours
Module 7	Electrical Materials	10.0 hours
Module 8	Raceway Bending and installation	25.0 hours
Module 9	Circuit Layout and wiring	25.0 hours
Module 10	Switch Boards	25.0 hours
Module 11	Overcurrent Protection	15.0 hours
Module 12	Device Installation	25.0 hours
Module 13	Remodeling Installations	25.0 hours
Module 14	Lighting Installation	25.0 hours
Module 15	Service Installation	15.0 hours
Module 16	Residential Equipment Connections	15.0 hours
Module 17	Employer Specific Skills	-
	Total	**300**

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

EMPLOYABILITY SKILLS

Module 1 (15 Hours)

Competencies and Outcomes	Strategies for Competencies
1. Employability Skills. a. Pass a test for color blindness (test performed by health services). b. Demonstrate the ability to dress appropriately for work. c. Demonstrate the ability to arrive for work on time. d. Demonstrate the ability to respond appropriately to supervision. e. Demonstrate the ability to follow written and verbal directions. f. Demonstrate the ability to listen effectively. g. Demonstrate the ability and ask for clarification when further information is required. h. Demonstrate the ability to share information accurately and explain procedures to another person. i. Demonstrate the ability to take initiative. j. Demonstrate the ability to work harmoniously as a member of a team with diverse races, sexes, ages and cultures, treating all with respect.	**Teaching:** • Describe employment opportunities available for electricians and electrical technicians and electrical related employees including potential earnings, employee benefits, job availability, possible places of employment, working conditions, and educational requirements. • Describe basic employee responsibilities including punctuality, physical requirements, customer relations, following directions, job safety. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

k. Demonstrate the ability to maintain good grooming and hygiene . l. Demonstrate the ability to stay on task and use time wisely. m. Demonstrate the ability to access and use trade information from manuals and computers (code requirements, manufacturer specifications (recommendations etc.). n. Demonstrate the ability to work a full day's work. o. Demonstrate the ability to change from one task to another and adapt easily to a variety of job tasks and situations. p. Demonstrate a positive attitude toward work and people. g. Demonstrate the ability to respect the worth of tools, equipment, materials and other people's property. r. Demonstrate the ability to complete assigned tasks. s. Demonstrate the ability to work safely. t. Demonstrate the ability to accept constructive criticism. u. (Optional) Complete "My Personal Employability Plan" (My –PEP).	

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 2
Basic Electrical Theory
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Basic Electrical Theory. a. Distinguish between volts, ohms, amps and their interrelationships in an electrical circuit. b. Identify the characteristics of alternating current and direct current. c. Solve electrical circuit problems using Ohm's Law. d. Solve electrical circuit problems using Watt's Law. e. Demonstrate problem-solving using Kerchhoff's Law. f. Wire and explain the characteristics of simple series circuits. g. Wire and explain the characteristics of simple parallel circuits.	**Teaching:** • Describe the terms and scientific principles associated with direct current electricity. • Have the students create circuits and measure DC electricity using the multimeter. • Have the students apply the various laws while solving circuit problems. • Describe the terms and scientific principles associated with alternating current electricity. • Describe and construct series and parallel circuits. **Assessment:** • Have students evaluate each other on problems. • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 3
Safety
(20 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Safety. a. Understand the safe use of hand and power tools and cabling equipment. b. Demonstrate basic electrical safety. c. Distinguish between safe and unsafe electrical installation practices. d. Distinguish between safe and unsafe practices when working with live circuits. e. Demonstrate proper use of electrical safety equipment. f. Use extreme caution when blindly drilling or sawing into walls, ceiling or floats where electrical wiring may be present. g. Determine exit points before pushing metal fish through conduit. Many conduits terminate at high voltage points in electrical panels. h. Identify techniques and practice for fire prevention. i. Demonstrate proper lock out/tag out procedures.	**Teaching:** • Describe general safety rules for working in a workshop/lab and industry. • Identify and apply safety around welding operations. • Identify and explain the use of various barriers and confinement. **Assessment:** • Have students evaluate, write and list a set of safety rules for electrical work. Have students check each others work. • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

j. Inspect the work area to insure a safe working environment. k. Isolate work areas when working in hallways and public spaces. l. Practice safety when working on ladders and scaffolding. m. Identify hazardous electrical materials and describe safe procedures for handling these materials.	

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 4
Introduction to Electricity
(15 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Introduction to Electricity. a. Describe program operation (TARS and reference materials). b. Describe Job responsibilities for electrical occupations. c. Perform math computations related to the electrician vocation.	**Teaching:** • Introduce the TARS. • Describe occupations within the electrical field. Have students make a list of job possibilities. • Discuss how to recognize and demonstrate how to use metric units of length, weight, volume and temperature. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 5
Hand and Power Tools
(10 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Hand and Power Tools a. Identify and demonstrate safe/proper use of hand and power tools used in the electrician trade. b. Demonstrate proper care and maintenance of hand and power tools and equipment. c. Demonstrate the proper use of tools and equipment used in the electrical trade including: • Knockout punches • Benders • Pipe Threaders • Power hand tools • Electrical test equipment • Saws • Other	**Teaching:** • Identify the various hand and power tools and their safe usage. • Have each of the students demonstrate knowledge of the elements listed in Competency C. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 6
Blueprints and Specifications
(10 Hours)

Competencies and Outcomes	Strategies for Competencies
1. Blueprints and Specifications a. Measure objects (metric type) to perform accurate measurements to the nearest 1/16. b. Interpret information and symbols (outlets, switches, etc.) listed on blueprints (plans, elevations, sections and schedules) and in specifications. c. Read and interpret simple schematic drawings. d. Identify residential and commercial construction components (studs, trusses, plates, chases, etc.). e. Follow specifications drawing and code requirements for rough-in wiring. f. Select materials in compliance with specifications, drawings, and code requirements.	**Teaching:** • Identify terms and symbols commonly used on blueprints used in the electrical trades. • Relate information on blueprints to real parts and locations. • Identify and apply basic principles of blueprints. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 7
Electrical Materials
(110 Hours)

Competencies and Outcomes	Strategies for Competencies
1. Electrical Materials a. Identify boxes commonly used in electrical construction. b. Identify devices commonly used in electrical construction. c. Identify covers and plates commonly used in electrical construction. d. Identify and describe the proper use of Fasteners used in the electrical trade (struts, straps, toggle bolts, shields, tapping screws, staples, nails, etc.). e. Identify types of conduit (EMT, rigid) and fittings. f. Identify boxes and their proper use in the electrical trade. g. Identify fittings (connectors, couplings, straps, etc.) and their proper use in the electrical trade. h. Identify conductors (copper, aluminum, etc.) and their proper use in the electrical trade. i. Identify cable (Romex, Bx, Fiber, etc.) and their proper applications in the electrical trade.	**Teaching:** • Demonstrate conduit bending. • Demonstrate the installation of fasteners and anchors. • Demonstrate the installation of various raceways, boxes and fittings. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 8
Raceway Bending and Installation
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1. Raceway Bending and Installation a. Find and explain directions for using the following: • Electrical metallic tubing (EMT). • Electrical non-metallic tubing. • Rigid steel conduit. • Rigid non-metal conduit. • Surface raceways (wire mold). • Flexible metallic conduit. • Armored cable (BX). b. Bend an offset saddle, and back bend using a manual bender for EMT, two sizes. c. Install the following: • Electrical metallic tubing (EMT). • Rigid steel conduit. • Armored cable (BX). • Liquid-tight flexible conduit.	**Teaching:** • Demonstrate all of the materials and processes listed under Competencies and Outcomes. • Have the students demonstrate all of the processes. **Assessment:** • Have the students evaluate and score the other student's processes. • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 9
Circuit layout and Wiring
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1. Circuit layout and Wiring. a. Explain the procedure to install cable according to Articles in the BEC. b. Install non-metallic sheathed cable to BEC requirements. c. Explain the procedure to install SE cable, according to the BEC. d. Install type SE cable to BEC requirements. e. Calculate service entrance loads. f. Install a smoke detector system. g. Install the following circuit of 90 volts or less. • Two –button chimes. • Thermostats. • Smoke detectors. • Step-down transformers.	**Teaching:** • Describe terms from the BEC. • Demonstrate the installation of assorted equipment to BEC standards. • Demonstrate the ability to calculate loads and to distribute them as required. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Switch Board

Module 10
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Switch Board a. Identify at least two types of safety switch enclosures using switch boards. b. Identify common switch board accessories. c. Identify parts of a breaker load center. d. Identify common panel inferior configurations. e. Install single, double and three-pole breakers. f. Install GFCI circuit breakers. g. Neatly shape and terminate conductors in switch boards. h. Identify components and installation procedures for basic three-phase service entrances. i. Install a basic single-phase service entrance. j. Identify components and installation procedures for basic three-phase service entrances. k. Install a basic three- phase service entrance.	**Teaching:** • Demonstrate the types of overcurrent protection devices including fuses, circuit breakers, arc fault interrupters and ground fault circuit interrupters (GFCI) used in safety switches or switch board. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 11
Overcurrent Protection
(15 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Overcurrent Protection a. Identify types of fuses rated 600v or less. b. Identify types of breakers rated 600 V or less (bolt-on and snap-in)	**Teaching:** • Demonstrate the identification of overcurrent protection devices. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 12
Device Installation
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Device Installation a. Find and explain applicable switch and receptacle outline Articles in the BEC. b. Install the following: • Single pole switch. • 3-way switch. • 4- way switch. c. Install the following receptacle outlets: • Duplex grounding type-wired receptacle. • Switch controlled split-wired receptacle. • Multi-circuit split-wired receptacle. • Range or dryer receptacle. • Twist locks receptacles. • Cord caps and plugs. • Timers e. Explain the function, operation and BEC requirements for GFCI circuits. f. Install and test GFCI receptacles.	**Teaching:** • Demonstrate how to determine locations of electrical outlets as shown on blueprints. • Demonstrate the installation of various switches and receptacles. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 13
Remodeling Installations
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Remodeling Installations a. Install a box and cable in an existing partition wall. b. Demonstrate the ability to patch holes in concrete and drywall.	**Teaching:** • Demonstrate how to install boxes and cables and how to patch holes. • Have the students install and repair and score each other. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 14
Lighting Installation
(25 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Lighting Installation a. Install surface mounted incandescent light fixtures. b. install recessed incandescent light fixtures. c. Retrofit ballasts. d. Install surface mounted fluorescent light fixtures. e. Install recessed fluorescent light fixtures. f. Install HID-type light fixtures.	**Teaching:** • Demonstrate how to install various lighting fixtures. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Module 15
Service Installations
(15 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Service Installations a. Follow appropriate safety precautions when excavating. b. Install raceways with service entrance conductors; properly ground to meter base. c. Connect a meter base assembly to switch board center or panel board.	**Teaching:** • Discuss and demonstrate service installations. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Residential Equipment Connections

Module 16
(15 Hours)

Competencies and Outcomes	Strategies for Competencies
1- Residential Equipment Connections a. Connect a supply cord to a free standing range/ dryer. b. Install a fixed appliance equipped with a pigtail to a branch circuit. c. Install a disconnecting means for HVAC equipment/ safety switch.	**Teaching:** • Demonstrate residential equipment installations. **Assessment:** • Validate mastery of the skillsets using the TAR Checklist.

The funding for the development of this curriculum was provided by USAID – (United States Agency for International Development)

Appendix A

TAR
(Training Achievement Record)

Evaluation Checklist for Electrical

Directions for Completing TARs

A. When the student performs a task listed in the "DUTIES AND TASKS" column, the instructor should rate the student's level of performance by circling a, b, or c in the "PERFORMANCE RATING" column.

RATING

a - Proficient and able to teach others	The student consistently performs the task accurately without supervision. The student possesses sufficient skill to teach the task to others.
b - Proficient	The student performs the task to industry standards with little or no supervision. This is the minimum performance rating for TAR skill completion.
c - Exposed/not proficient	The student has been introduced to the task, but cannot perform the task to industry standards.

1. If the student performs the task at a level c, circle the number in pencil so that it can later be erased and entered permanently as b or a when the student improves his/her performance. A performance level of b is satisfactory (passing) and can be entered permanently or, at the instructor's discretion, circled in pencil to allow the student to improve his/her performance at a later date.
2. When the student performs the task to the instructor's satisfaction, **(at a level of b or a)** circle the appropriate performance rating, and enter the date in the **"DATE COMPLETED"** column. The instructor and student should initial the **DUTY** area when **all the tasks** in that duty area are completed.

B. When the student completes the TAR or terminates the program before completing the TAR, the instructor must finalize the TAR by doing the following:

1. Check the appropriate box and enter the date that the student completed the TAR or terminated the training program in the space provided at the top of page 1:

□ Completed or □ Terminated Training: _____
Date

ELECTRICIAN
Electrician Helper
87202JA

TRAINING ACHIEVEMENT RECORD (TAR) FOR:

Name: _____

SSN: _____

Date Entered Training: _____

☐ Completed or ☐ Terminated Training: _____
Date

JOB CORPS CENTER: _____

Address: _____

_____

Phone: _____

Instructor: _____

PREREQUISITE:
None

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
A. EMPLOYABILITY SKILL				
1. Pass a test for color blindness (test performed by health services).	a b c[1]			
2. Demonstrate the ability to dress appropriately for work.	a b c			
3. Demonstrate the ability to arrive for work on time.	a b c			
4. Demonstrate the ability to respond appropriately to supervision.	a b c			
5. Demonstrate the ability to follow written and verbal directions.	a b c			
6. Demonstrate the ability to listen effectively.	a b c			
7. Demonstrate the ability to ask for clarification when further information is required.	a b c			
8. Demonstrate the ability to share information accurately and explain procedures to another person.	a b c			
9. Demonstrate the ability to take initiative.	a b c			
10. Demonstrate the ability to work harmoniously as a member of a team with diverse races, sexes, ages and cultures, treating all with respect.	a b c			
11. Demonstrate the ability to maintain good grooming and hygiene.	a b c			
12. Demonstrate the ability to stay on task and use time wisely.	a b c			
13. Demonstrate the ability to access trade information from manuals and computers (i.e. code requirements, OSHA requirements, manufacturer specifications/recommendations, etc.).	a b c			

[1] a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
14. Demonstrate the ability to work an eight hour day.	a b c			
15. Demonstrate the ability to change from one task to another and adapt easily to a variety of job tasks and situations.	a b c			
16. Demonstrate a positive attitude toward work and people.	a b c			
17. Demonstrate the ability to respect the worth of tools, equipment, materials and other people's property.	a b c			
18. Demonstrate the ability to complete assigned tasks.	a b c			
19. Demonstrate the ability to work safely.	a b c			
20. Demonstrate the ability to accept constructive criticism.	a b c			
21. (Optional) Complete "My Personal Employability Plan" (My-PEP).	a b c			
B. BASIC ELECTRICITY THEORY				
1. Distinguish between volts, ohms, amps and watts and their interrelationships in an electrical circuit.	a b c			
2. Identify the characteristics of alternating current and direct current.	a b c			
3. Solve electrical circuit problems using Ohm's Law.	a b c			
4. Solve electrical circuit problems using Watt's Law.	a b c			
5. Demonstrate problem-solving using Kirchhoff's Law.	a b c			
6. Wire and explain the characteristics of simple series circuits.	a b c			
7. Wire and explain the characteristics of simple parallel circuits.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
C. SAFETY				
1. Understand the safe use of hand and power tools and cabling equipment.	a b c			
2. Demonstrate basic electrical safety.	a b c			
3. Distinguish between safe and unsafe electrical installation practices.	a b c			
4. Distinguish between safe and unsafe practices when working with live circuits.	a b c			
5. Demonstrate proper use of electrical safety equipment.	a b c			
6. Use extreme caution when blindly drilling or sawing into walls, ceilings or floors where electrical wiring may be present.	a b c			
7. Determine exit points before pushing metal fish tape through conduit. Many conduits terminate at high voltage points in electrical panels.	a b c			
8. Identify techniques and practices for fire prevention.	a b c			
9. Demonstrate proper lockout/tagout procedures.	a b c			
10. Inspect the work area to insure a safe working environment.	a b c			
11. Isolate work areas when working in hallways and public spaces.	a b c			
12. Practice safety when working on ladders and scaffolding.	a b c			
13. Identify hazardous electrical materials and describe safe procedures for handling these materials.	a b c			
D. INTRODUCTION TO ELECTRICITY				
1. Describe program operations (TARs and reference materials).	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
2. Apply knowledge of Articles 90 (Introduction) and 100 (Definitions) of the National Electrical Code (NEC).	a b c			
3. Describe job responsibilities for electrical occupations.	a b c			
4. Perform math computations related to the electrician vocation.	a b c			
E. HAND AND POWER TOOLS				
1. Identify and demonstrate safe/proper use of hand and power tools used in the electrician trade.	a b c			
2. Demonstrate proper care and maintenance of hand and power tools and equipment.	a b c			
3. Demonstrate the proper use of tools and equipment used in the electricial trade including:				
a. Knockout punches	a b c			
b. Benders	a b c			
c. Pipe threaders	a b c			
d. Power hand tools	a b c			
e. Electrical test equipment	a b c			
f. Saws	a b c			
g. Other:	a b c			
F. BLUEPRINTS AND SPECIFICATIONS				

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
1. Measure objects to the nearest 1/16".	a b c			
2. Interpret information and symbols (outlets, switches, etc.) listed on blueprints (plans, elevations, sections and schedules) and in specifications.	a b c			
3. Read and interpret simple schematic drawings.	a b c			
4. Identify residential and commercial construction components (studs, trusses, plates, chases, etc.).	a b c			
5. Follow specifications, drawing, and code requirements for rough-in wiring.	a b c			
6. Select materials in compliance with specifications, drawings, and code requirements.	a b c			
G. ELECTRICAL MATERIALS				
1. Identify boxes commonly used in electrical construction.	a b c			
2. Identify devices commonly used in electrical construction.	a b c			
3. Identify covers and plates commonly used in electrical construction.	a b c			
4. Identify and describe the proper use of fasteners used in the electrical trade (struts, straps, toggle bolts, shields, tapping screws, staples, nails, etc.).	a b c			
5. Identify types of conduit (EMT, rigid) and fittings.	a b c			
6. Identify boxes and their proper use in the electrical trade.	a b c			
7. Identify fittings (connectors, couplings, straps, etc.) and their proper use in the electrical trade.	a b c			
8. Identify conductors (copper, aluminum, etc.) and their proper use in the electrical trade.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
9. Identify cable (Romex, BX, fiber, etc.) and their proper applications in the electrical trade.	a b c			
H. RACEWAY BENDING AND INSTALLATION				
1. Find and explain applicable articles in the NEC for the following:				
a. Electrical metallic tubing (EMT)	a b c			
b. Electrical non-metallic tubing	a b c			
c. Rigid steel conduit	a b c			
d. Rigid non-metal conduit	a b c			
e. Surface raceways (wire mold)	a b c			
f. Flexible metallic conduit	a b c			
g. Armored cable (BX.	a b c			
2. Bend an offset, saddle, and back bend using a manual bender for EMT, 1/2" and 3/4"	a b c			
3. Install the following:	a b c			
a. Electrical metallic tubing (EMT)	a b c			
b. Rigid steel conduit	a b c			
c. Armored cable (BX)	a b c			
I. CIRCUIT LAYOUT AND WIRING				
1. Explain the procedure to install cable according to the BEC.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
2. Install non-metallic sheathed cable to BEC requirements.	a b c			
3. Explain the procedure to install type SE cable according to the BEC.	a b c			
4. Install type SE cable to BEC requirements.	a b c			
5. Calculate service entrance loads.	a b c			
6. Draw install a smoke detector system.	a b c			
7. Install the following circuits of 90 volts or less:	a b c			
a. Two-button chimes	a b c			
b. Thermostats	a b c			
c. Smoke detectors	a b c			
d. Step-down transformers	a b c			
J. SWITCH BOARDS				
1. Identify at least two types of safety switch enclosures.	a b c			
2. Identify common switch board accessories.	a b c			
3. Identify parts of a breaker load center.	a b c			
4. Identify common panel interior configurations.	a b c			
5. Install single, double and three-pole breakers.	a b c			
6. Install GFCI circuit breakers.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
7. Neatly shape and terminate conductors in switch board.	a b c			
8. Identify components and installation procedures for basic single-phase service entrances.	a b c			
9. Install a basic single-phase service entrance.	a b c			
10. Identify components and installation procedures for basic three-phase service entrances.	a b c			
11. Install a basic three-phase service entrance.	a b c			
K. OVERCURRENT PROTECTION				
1. Identify types of fuses rated 600V or less.	a b c			
2. Identify types of breakers rated 600V or less (bolt-on and snap-in).	a b c			
L. DEVICE INSTALLATION				
1. Find and explain applicable switch and receptacle outlet Articles in the BEC.	a b c			
2. Install the following:				
a. Single pole switch	a b c			
b. 3-way switch	a b c			
c. 4-way switch	a b c			
3. Install the following receptacle outlets:				
a. Duplex grounding type receptacle	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
b. Switch controlled split-wired receptacle	a b c			
c. Multi-circuit split-wired receptacle	a b c			
d. Range or dryer receptacle	a b c			
e. Twist lock receptacles	a b c			
f. Cord caps and plugs	a b c			
g. Timers	a b c			
4. Explain the function, operation and BEC requirements for GFCI circuits.	a b c			
5. Install and test GFCI receptacles.	a b c			
M. REMODELING INSTALLATIONS				
1. Install a box and cable in an existing partition wall.	a b c			
2. Demonstrate the ability to patch holes in concrete and drywall.	a b c			
N. LIGHTING INSTALLATION				
1. Install surface mounted incandescent light fixtures.	a b c			
2. Install recessed incandescent light fixtures.	a b c			
3. Retrofit ballasts.	a b c			
4. Install surface mounted fluorescent light fixtures.	a b c			
5. Install recessed fluorescent light fixtures.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

DUTIES AND TASKS	PERFORMANCE RATING	DATE COMPLETED	INSTRUCTOR'S INITIALS	STUDENT'S INITIALS
6. Install HID-type light fixtures.	a b c			
O. SERVICE INSTALLATIONS				
1. Follow appropriate safety precautions when excavating.	a b c			
2. Install raceways with service entrance conductors; properly ground to meter base.	a b c			
3. Connect a meter base assembly to switch board or panel board.	a b c			
P. RESIDENTIAL EQUIPMENT CONNECTIONS				
1. Connect a supply cord to a free standing range/dryer.	a b c			
2. Install a fixed appliance equipped with a pigtail to a branch circuit.	a b c			
3. Install a disconnecting means for HVAC equipment/safety switch.	a b c			
Q. EMPLOYER SPECIFIC SKILLS (OPTIONAL)				
1.	a b c			
2.	a b c			
3.	a b c			
4.	a b c			
5.	a b c			

* a - Proficient and able to teach others; b - Proficient; c - Exposed/not proficient

Appendix B

Workplace Skills for the 21st Century for Electrical

Workplace Skills for the 21st Century for Module 1

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP6 Employs thinking skills including creative thinking, decision making, Problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 2

WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, Problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility,integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 3

WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 4

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 5

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 6

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 7

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 8

WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 9

WP1 Allocates resources (time, money, materials and facilities, and human resources).

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 10

WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 11

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 12

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 13

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 14

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 15

WP1 Allocates resources (time, money, materials and facilities, and human resources).
WP2 Acquires, evaluates, organizes and maintains, and interprets/ communicates information, including the use of computers.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Workplace Skills for the 21st Century for Module 16

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
WP5 Selects, applies, and maintains/troubleshoots technology.
WP7 Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8 Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

Appendix C

Suggested References

Suggested References

National Center for Construction Education and Research. (2004). *Core curriculum; Introductory Craft Skills.* Upper Saddle River, NJ: Pearson Prentice Hall.

National Center for Construction Education and Research. (2004). *Electrical Level 1,2,3,4.* Upper Saddle River, NJ: Pearson Prentice Hall.

Winterville, GA (2000) *Developing safety skills for shop or home.* American Association for Vocational Instructional Materials &Tuscaloosa, AL: Resource Center for Technology.

Holzman, H. N. (2002). *Modern residential wiring.* Tinley Park, IL: Goodheart Willcox.

Kaltwasser, S., Flowers, G., & Blasingame, D. (1999). *Basic wiring.* Stillwater, OK: Mid-America Vocational Curriculum Consortium.

Mazur. G.A, Zurlis, P.A. (2003). *Electrical Principles and Practices.* USA American Technical Publishers.

Fletcher, G. (2004). *Residential construction academy house wiring.* Clifton Park, NY: Delmar Thomson Learning.

Herman, S. L. (2004). *Delmar's standard textbook of electricity.* Clifton Park, NY: Delmar Thomson Learning.

Appendix D

Recommended Tools & Equipment

ITEM	المادة	الكمية
EMT bender, 1/2"	لاوية 1\2 انج	للقطعة 2
EMT bender, 3/4"	لاوية 3\4 انج	للقطعة 2
EMT bender, 1"	لاوية 1 انج	للقطعة 2
EMT bender, 1-1/4"	لاوية 1 - 1\4 انج	للقطعة 2
tri-stand with screw-type vise	ملزمة ذات مسند ثلاثي	للقطعة 2
exposed ratchet drop head threader, 1/2" - 1" dies, manual	أداة تسنين يدوية - دايس 1\2 - 1 انج	للقطعة 1
multi-meter (standard), digital	جهاز قياس ديجيتال	10 للقطعة
multi-meter (clamp-on)	كلامب ميتر	للقطعة 2
hammer drill, 3/4" (Hilti, Model T75)	درل هامر 3\4 الانج	للقطعة 1
drill, electric, 1/2", variable speed, reversing, h.d. (hammer)	دريل كهربائي 1\2 الانج متغير السرعة و متغير الدوران (مطرقة)	للقطعة 2
drill, right angle, 1/2", h.d.	دريل - قائم الزاوية 1\2 الانج	للقطعة 1
circular saw, electric, 7-1/4"	منشار كهربائي دائري 7 - 14\1 انج	للقطعة 1
bench grinder, 6", electric	كوسرة منضدية 6 انج كهربائية	للقطعة 1
drill, cordless, ½", variable speed, reversing, h.d.	كوسرة منضدية 1\2 انج (لاسلكي)	10 للقطعة
multi-purpose workbench, wood top	منضدة حرفية متعددة الاستخدامات	للقطعة 4
tap and die set (English)	سيت ادوات التثقيب والتسنين (نظام انكليزي)	للقطعة 1
bolt cutter, 24"	كتر ذو حجم متغير 24 انج	للقطعة 1
hand truck, h.d.	عربة تدفع باليد	للقطعة 1
bench vise, 6"	ملزمة منضدية 6 انج	للقطعة 4
ladder, extension, fiberglass, Type 1A, 24'	سلم - ذو امتداد ، فايبر كلاس 24 قدم	للقطعة 1
step ladder, fiberglass, double step, Type 1A, 6'	سلم ذو مسند - فايبر كلاس 6 قدم	للقطعة 3
step ladder, fiberglass, double step, Type 1A, 12'	سلم ذو مسند - فايبر كلاس 12 قدم	للقطعة 1
Baker scaffold unit, 5' wide, 3 frames high, guardrails, wheels and jacks	سكلة ذات عجلات 5 اقدام عرض	للقطعة 1
Tape measure retracable, 10m	فيتة قياس ، 10 متر	10 للقطعة
Lock out \ Tag out kits	علبة عزل محكمة القفل ، و تعلم بانها تحت الاستعمال	للقطعة 2
9" Cable Cutter (Portable Belts)	كتر ل 9 انج كبل (حزام عدة)	للقطعة 2
Tool Boxes	صناديق عدد	10 للقطعة
wet-dry vacuum, w/wire pulling attachment	مكنسة كهربائية رطب-جاف	للقطعة 1
gang tool box, 3'	صندوق العدة 3 اقدام	للقطعة 2

wire spool rack	لفة أسلاك	للقطعة 5
rotary storage bin	صندوق حفظ دائري	للقطعة 1
PVC heat gun with accesories	مسدس حراري PVC و ملحقاته	للقطعة 2
screw driver set, slotted and phillips blades, various sizes	سيت درنفيسات مربع و اعتيادي باحجام مختلفة	10 سيتات
socket set, ½ and ¼" drive, ratchet and extensions, English and Metric sockets	سيت مفاتيح ربط 2\1 و 4\1 انج ذو سويتج متري او انكليزي	10 سيتات
wrench set, open/box ends, English and Metric wrenches	سيت مفاتيح ربط - لوي ذو نظام متري او انكليزي	10 سيتات
allen wrench set, English and Metric wrenches	سيت مفاتيح ألنكي ذو نظام انكليزي و متري	10 سيتات
side cutters, 9"	كتر 9 انج	10 للقطعة
hammer, 4#	مطرقة رقم 4	10 للقطعة
sledge hammer, 10#	مطرقة ثقيلة رقم 10	للقطعة 1
crow bar	عتلة	للقطعة 1
level, 2'	ميزان بناء 2 قدم	للقطعة 1
metal stud punch	مثقاب معدني	للقطعة 1
pull rope, nylon, 1/4", 600' roll	حبل سحب نايلون 4\1 انج ، رولة 600 قدم	رولة 1
pull rope, nylon, 1/2", 250' roll	حبل سحب نايلون 4\1 انج ، رولة 600 قدم	رولة 1
pull sleeves, wire basket type, various sizes	أطراف سحب ، نوع شكل سلة ، باحجام مختلفة	سيت 1
come-along, cable type	عتلة رافعة ، مع عجلات	للقطعة 2
hard hats	قبعة صلبة	14 للقطعة
safety glasses	نظارات حماية	24 للقطعة
fall protection harness	طقم الحماية من السقوط	للقطعة 2
First Aid kit Industrial	سلة الاسعافات الاولية	للقطعة 1
Pliers, slip-joint	كماشة ذات مفصل منزلق	10
Hacksaw	منشار معادن	10
Saw, keyhole	منشار يدوي بشكل مفتاح	10
File set	سيت مبارد	10
Chisel Set (Cold & Wood)	ازميل	10
Magnetic torpedo level	ميزان بناء مغناطيسي	10
Hole saw and arbor set	منشار محوري للعمل الفجوات	1
Ship auger drill bit set	سيت مثاقب لولبية للدريل	2
Drill bit set	سيت مثاقب للدريل	2
Needle nose pliers	كماشة ذات رأس رفيع	10
Lineman's pliers	كماشة قطع الأسلاك	10
Soldering iron (25w)	حديد لحيم	10
Adjustable wire strippers	نازعة غطاء الأسلاك - جالخة	10
Cutting/crimping tool	قاطعة-قارصة اسلاك	10
Tool pouch	حقيبة عدة	10

Circuit tester	جهاز فحص الدائرة الكهربائية	10
Fuse puller	نازعة الصمامات-فيوزات	10
Electrician's hammer	مطرقة كهربائية	10
Electrician's knife	سكين خاص بالكهربائيين	10
Rubber gloves (1 pair/10 students)	قفازات مطاطية زوج ل 10 طلاب	1
Rubber hose (line hose)	خرطوم مطاطي	1
Rubber blanket	بطانية مطاطية	1
DC power source	مصدر كهرباء مستمر	10
Electrical resistance/insulation tester	جهاز فحص المقاومة/العزل الكهربائي	5
Isolation transformer	محولة عازلة	10
Soldering/desoldering equipment	اداة اللحيم/فتح اللحيم	10
Voltage isolation transformers (adjustable)	محولة عازلة للفولطية - متغيرة	5
Single phase motors Two speed (1); Dual voltage (1);Reversing (1)	ماطور أحادي الطور	1
Three-phase motors Two-speed (1); Dual voltage (1); Reversing (1)	ماطور ثلاثي الطور	1
Single-phase controllers: Two-speed (1); Reversing (1)	اجهزة سيطرة أحادية الطور	1
Full voltage magnetic three-phase controllers: Two speed (1); Reversing (1)	اجهزة سيطرة مغناطيسية للفولطية- ثلاثية الطور	1
Full voltage magnetic controller	جهاز سيطرة للفولطية - كامل	1
Combination square	زاوية تخطيط - متغير القياس	1
Wire brush	فرشاة سلكية	1
Rip saw	منشار خشب	3
Plumb bobs	شاقول	5
Wedges (Assortment)	أوتاد تنسيق	1
Chalk line	أداة تسطير	10
Angle grinder	كوسرة زاوية	1
Oscillioscope	اوسيلوسكوب	1